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Reply to Office action of: 11/21/2006

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

Claim 1 (currently amended) A system for protection against short-circuits in electric power distribution architectures at two substantially different voltage levels, comprising:

at least a first battery B1 at a first voltage level, and a second battery B2 at second, substantially higher voltage level, both said batteries being provided with an automatic disconnection device SDB and intended as providing a differentiated electric power supply for respective network sectors;

said network sectors having power distribution units (10), (20), (30) directing power to loads (12), (22), (23), (32), (33), each one of the said power distribution units (10), (20), (30) being controlled by a corresponding microcontroller (10a), (20a), (30a), said at least first battery B1 and sectors that it supplies being fed in turn from the said second battery B2 through a converter DC/DC;

said battery B2 being connected to a voltage generator;

characterised in that said first battery B1, at a lower voltage level, has having an associated module SMM microcontroller monitoring the voltage and current at the posts of said battery B1 and sensing an operating state of said converter DC/DC, said module SMM microcontroller of battery B1 is being connected through a port and a communications network N with each one of control said microcontrollers (10a), (20a), (30a) of the said power distribution units (10), (20), (30) of the said loads (12), (22), (23), (32), (33), in order to,

allowing in facing a short-circuit situation being sensed by said module SMM microcontroller, according to the detection of a predetermined state of the said converter DC/DC, followed by predetermined, sensed voltage and current values, informing each one of the said microcontrollers (10a), (20a), (30a) of said power distribution units (10), (20), (30) in order to activate allowing activation of said automatic disconnection device SDB.

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Claim 2 (previously presented) A system according to Claim 1, characterised in that said communications network N is a dedicated network.

Claim 3 (previously presented) A system according to Claim 1, characterised in that said communications network N is a shared bus, preferably a CAN bus.

Claim 4 (previously presented) A system according to Claim 1, characterised in that said module SMM microcontroller or control node CN is included in an assembly for the dynamical measurement of the state of health (SOH) and state of charge (SOC) of said battery B1.

Claim 5 (previously presented) A system according to Claim 1, characterised in that said module SMM microcontroller control node CN is included in an assembly for the control and management of all or part of the loads fed by said battery B1.

Claim 6 (previously presented) A system according to Claim 1, characterised in that said power distribution units (10), (20), (30) of the loads (12), (22), (23), (32), (33) controlled by said microcontroller (10a), (20a), (30a), supply loads (12), (22), (32) of said sector, at a lower voltage level, fed from battery B1, and said microcontrollers (23a), (33a) supply loads (23), (33) included in said higher-voltage-level sector fed by said battery B2.

Claim 7 (previously presented) A system according to Claim 6, characterised in that said loads (23), (33) are governed by power switches (23a, 33a) said power switches (23a), (33a) controlled by said corresponding microcontroller (20a, 30a) of said power distribution unit (20), (30).

Claim 8 (previously presented) A system according to Claim 7, characterised in that said power switches (23a), (33a) are FET devices with current sensing.

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Claim 9 (previously presented) A system according to Claim 7, characterised in that said power distribution units (10), (20), (30) comprise in cooperative combination said power switches (23a), (33a) and said respective microcontroller (20a), (30a) for sensing the voltage or impedance at the output of said power switches (23a), (33a) prior to said controlled load (23), (33), allowing avoidance of connection to said controlled load (23), (33) where said values are outside of predetermined values.

Claim 10 (previously presented) A system according to Claim 1, characterised in that each one of said batteries B1 and B2 is provided with a module SMM microcontroller for controlling at least a disconnection device (SDB) of said batteries.

Claim 11 (currently amended) A method for protection against short-circuits in electric power distribution architectures at having two substantially different voltage levels, said architectures comprising:
    at least a first battery B1 at a first voltage level and a second battery B2 at a second, substantially higher voltage level, each of both said batteries being provided with an automatic disconnection device SDB, providing and designed to provide a differentiated supply of electric power to respective network sectors through power distribution units (10), (20), (30) to loads (12), (22), (23), (32), (33), each one of said power distribution units (10), (20), (30) being controlled by a corresponding microcontroller (10a), (20a), (30a);
    said at least first battery B1 and sector or network sectors it supplies capable of being fed in turn from the second battery B2 through a converter DC/DC;
    said battery B2 being connected to a voltage generator;
said method characterised by as performing permanent monitoring of at least the voltage and current at the posts of said battery B1, as well as and of the state of the converter DC/D; and
    further characterized in that when if said monitored voltage and current values exceed a predetermined threshold, each one of the microcontrollers (10a, 20a, 30a) of said power distribution units (10, 20, 30), is signalled through a communications network N to perform a short-circuit protection power interruptions.

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Claim 12 (previously presented) A method according to Claim 11, characterised in that
during the short-circuit sensing step, sensing of a stoppage state of the conversion process
of the converter DC/DC, acquisition of voltage at the posts of battery B1, at a lower
voltage level, and finally sensing of a possible load current of said battery B1 are
performed in an ordered and sequential manner, and, if the predetermined values fall
within pre-set ranges, signal the power distribution units (10, 20, 30) of an eventual short-
circuit situation, by sending a priority interruption signal through said network N to the
microcontrollers (10a, 20a, 30a).

Claim 13 (previously presented) A method according to Claim 11, characterised in that
said short-circuit protection process comprises a complete disconnection of all the power
loads (23, 33) associated to each one of the power distribution units (20), (30), and where
a short-circuit situation continues being sensed from said module SMM microcontroller
control node CN, a signal is sent through said communications network N for
disconnection of at least the higher-voltage-level battery B2, accessing in order to do so
the disconnection device SDB of said battery B2 or a control node CN associated to said
battery B2.

Claim 14 (previously presented) A method according to Claim 11, characterised in that in
case said complete disconnection of loads (23, 33) leads to a non-short-circuit situation,
as evaluated by said module SMM microcontroller control node CN, a reconnection of
the power loads (23), (33) of each power distribution unit (20, 30) is performed until
sensing the load or loads susceptible of generating said short-circuit situation, is
determined by said module SMM microcontroller control node CN.

Claim 15 (previously presented) A method according to Claim 14, characterised in that
prior to performing the reconnection of each one of said power loads (23), (33), a
measurement of the voltage or impedance at the output of a power switch (23a), (33a), to
controlling a corresponding load (23), (33), is performed, and in that in case the measured
values exceed a certain threshold, the involved load is left inactive.

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Claim 16 (previously presented) A method according to Claim 11, characterised in that said short-circuit protection process comprises progressively disconnecting all the power loads (23), (33) associated to each one of the power distribution units (20), (30), and checking, from said module SMM microcontroller control node CN, if a certain disconnection makes the short-circuit situation stop, in which case a permanent disconnection of the load involved is carried out, and in that in case a short-circuit situation continues being sensed from said module SMM microcontroller control node CN, after disconnection of all the power loads (23), (33) of each power distribution unit (20), (30), a signal for disconnection of at least higher-voltage-level battery B2 is sent through said communications network N, accessing disconnection device SDB of said battery B2 or a control node CN thereof associated to said battery B2.

Claim 17 (previously presented) A method according to Claim 11, characterised in that said short-circuit protection process comprises monitoring current demand in controlling devices, such as a power switch (23a), (33a), associated to each one of the power loads (23), (33) depending from each one of the power distribution units (20), (30), and disconnecting those loads wherein said demand exceeds a certain threshold, and in that, in case a short-circuit situation continues being sensed from said module SMM microcontroller control node CN, after the monitoring of all the power loads (23), (33) of each power distribution unit (20), (30), a signal for disconnecting at least the higher-voltage-level battery B2 is sent through said communications network N, accessing the disconnection device SDB of said battery B2 or a control node CN thereof associated to said battery B2.

Claim 18 (previously presented) A method according to Claim 11, characterised in that said power distribution units (20), (30) comprise devices such as power switches (23a), (33a) with current sensing, associated to each one of the power loads (23), (33), which power switches (23a), (33a) are controlled from the corresponding microcontroller (20a), (30a) of the unit, comprising a step of sensing the output state of each one of said switches (23a), (33a), particularly their voltage or impedance, and where a value sensed in a certain power switch (23a), (33a) exceeds a predetermined threshold, connection of the load (23), (33) associated therewith is not carried out.

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Claim 19 (previously presented) A method according to Claim 11, characterised in that in case that at completion of said short-circuit protection process by each one of said power distribution units (10, 20, 30) a short-circuit situation continues being sensed by the module SMM microcontroller control node CN, disconnection of the two batteries B1 and B2 from their corresponding network sectors is carried out.